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ABSTRACT

This paper discusses video and computer technologies for extended-campus programming (courses and programs at off-campus sites). The first section provides an overview of the distance education program at the University of Kentucky (UK), and highlights the improved access to graduate and professional programs, advances in technology, funding, staff, support services, library assistance, electronic mail, and joint doctoral programming. The second section describes UK's compressed video systems and programs: (1) the University of Kentucky Interactive Television Network, a digital video system; (2) the Kentucky TeleLinking Network (KTLN), a consortium of publicly supported universities and community colleges and numerous state and local agencies; (3) the KTLN Star Schools project, which will fund 46 new distance learning classrooms in universities and in over 20 high schools across Kentucky; and (4) the Telemedicine Network, which will improve access to health services for rural residents and practitioners. Development and expansion of the digital telephone infrastructure in Kentucky and initiatives to increase off-campus Internet access are also covered. The third section focuses on distance learning initiatives by Owensboro Community College (Kentucky) and the Community Networking Cooperative, which will provide community electronic mail and data services to all citizens of Owensboro by dial up modem. The fourth section describes the University Libraries services, and the fifth section discusses small college initiatives. (AEF)

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Video and Computer Technologies for Extended-Campus Programming

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1. Overview of University of Kentucky Extended-Campus Programming

Along with other major state universities, the University of Kentucky (UK) has a long history of providing courses and programs at off-campus sites. Because instruction was typically deliverd to the sites in person by the instructors, most of the courses were offered within reasonable commuting distance in central Kentucky.

In recent years the public's expectation has come to encompass a statewide graduate program and research mission for the University of Kentucky that provides much greater access to graduate and professional programs. In responding to this expectation the University is fulfilling the mission designated by the Kentucky Council on Higher Education and the philosophy guiding the development of land grant universities. The statewide outreach has been facilitated by recent advances in distance education technology which removes much of the travel burden from the instructors and from students.

A survey funded by the Kentucky Council on Higher Education and conducted by the UK Graduate School in 1989 revealed a high level of interest across the state in Ed.D. programs in Educational Administration and Higher Education. In response to the program needs revealed by the survey, funding for technology, instruction, and support services was made available by the president's office. The Departments of Administration and Supervision and Educational Policy Studies and Evaluation in the College of Education were asked to provide those Ed.D. specializations to extended-campus sites.

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Four sites have been designated as Extended Campus Graduate Program Sites-- Ashland, Owensboro, and Paducah Community Colleges and the University of Kentucky-Northern Kentucky University Graduate Center. The three community college sites have been connected by T-1 data lines to carry the instruction by interactive compressed video. The advantage of this technology is that it provides two-way audio and video, thereby facilitating greater interaction among students and instructor than is the case for instruction via satellite. However, courses offered via satellite serve students at dozens of sites both in

All satellite and compressed video sites are staffed by part-time technical coordinators who oversee the classroom on-site facilities and operate the local technology. The four graduate program sites are staffed by part-time (full at NKU), doctoral-level site directors who oversee all site activities, maintain close contact with students, and serve as liaisons to the program faculties at the Lexington campus. All staff members at the sites are coordinated jointly by University Extension and the Graduate School.

Currently nine colleges provide programs and/or courses to extended-campus sites:

Agriculture	Human Environmental Sciences
Arts and Sciences	Communications and Information Studies
Allied Health	Social Work
Education	Nursing
Engineering	

UK now has an extended-campus graduate enrollment of more than 400, of which more than 80 are doctoral students.

Several sectors and units cooperate to provide support services to extended- -campus students. The colleges in the academic sectors provide the programs and courses; Information Systems installs and maintains the technologies; University Extension provides logistical support (e.g., student registration); the Graduate School provides coordination of extended-campus program planning and implementation and liaison with the regional universities; and the community colleges provide facilities for housing the video classrooms as well as local library support.

A major strength of the UK extended-campus initiative is the quality of library support provided to students and faculty by the Extension Librarian. The Extension Librarian responds to students' requests for special searches and provides copies of articles, monographs, and books.

Each of the four graduate program sites is equipped to provide students with computer connections directly to the UK mainframe, allowing them to communicate by e-mail with instructors and perform searches of the library card catalog and databases.

The extended-campus Ed.D. programs have also provided an avenue for expanding the Joint Doctoral programming with the regional universities. This arrangement allows the students to take some of their doctoral coursework conveniently at the cooperating institutions, and two of the five advisory committee members may be from that institution. A majority of the 80+ extended- campus Ed.D. students have chosen the joint doctoral route.

The technology-based extended-campus initiative by the University can be described as one of the most significant efforts to bring its programs to people in all parts of the state. This is truly a modern-day expression of the traditional land grant mission of the University of Kentucky.

2. Compressed video

The current University of Kentucky distance learning initiative began in 1974. The University was selected as the network Operations Center for the Appalachian Community Service Network (ACSN). ACSN, a project supported by the Appalachian Regional Commission, was a one-way video, two-way audio, distance learning network delivered through NASA's ATS-6 communications satellite. ACSN moved from the University in 1978 to become a for-profit organization and is still in existence today as The Learning Channel.

The University continues to deliver distance education by satellite through membership in the National University Teleconferencing Network (NUTN), the National Technological University (NTU), the Agricultural Satellite Network (Ag*SAT), and Kentucky Educational Television's StarChannels.

The television system in the United States is based on analog technology and relies on the broadcast and cable television networks to transmit signals into our homes and classrooms. Since the analog television system is expensive and does not always provide connectivity to the specific classrooms that we are trying to reach, we determined that we needed a different kind of network. The University installed a two-way interactive compressed video network in 1991. The University of Kentucky Interactive Television (UKITV) Network is based on a digital video system. Digital compressed video systems were becoming a cost effective means of providing faculty and students with a fully interactive two-way video, two-way audio, network in the late nineteen eighties.

The compressed video system relies on standard video components such as cameras, VCR's, and microphones to capture the lecture and the students' interaction. The system differs from traditional analog video in that the standard television signal is sent to a coder/decoder (commonly called a CODEC). The University of Kentucky CODEC is actually an IBM compatible personal computer that is running specialized compression algorithm software.

The CODEC converts the analog video signal to a digital signal. When analog video is converted to digital the resulting signal requires 35 megabits per second (mbs) of bandwidth to transmit the signal. Bandwidth refers to the amount of information that can be transmitted in this case on a per second basis. Due to the high cost of the telephone services that are capable of handling 35 mbs we use compression algorithms to reduce the signal so that it can be transmitted over less expensive telephone lines.

The UK system compresses the video signal from 35 megabits per second to 384 kilobits per second, a ratio of over 90:1. This compression scheme removes information from the video signal such as some color, some resolution or sharpness, and most important the video becomes somewhat jerky. We are improving the video by installing accelertor boards in the CODEC's. These boards provide very smooth video as well as improving resolution and color.

We have installed the same equipment in every compressed video classroom on the network. Faculty are encouraged to teach from the remote sites at least two times during each semester. When they visit the remote sites they are quite comfortable since they find themselves in familiar surroundings.

There are nine rooms on the University of Kentucky Interactive Video Network: Network:

Lexington Campus
Medical Center Campus (Lexington)
Kentucky Educational Television)
Ashland Community College
Hazard Community College
Owensboro Community College (2 rooms)
Paducah Community College
Paducah Information Age Park

Connections are also provided to Kentucky State Government offices in Frankfort and to other universities across the Commonwealth of Kentucky. The UKITV Network is connected to the SPRINT VIDEO GROUP providing access to interactive video facilities across the nation and around the world. The UKITV network is also connected to and is a part of the Kentucky TeleLinking Network.

The Kentucky TeleLinking Network (KTLN) is a consortium of the Commonwealth's publicly supported universities and community colleges, the Council on Higher Education, the Kentucky Department of Information Systems, the Kentucky Department of Education, Kentucky Educational Television, and numerous other state and local agencies.

KTLN is currently implementing a United States Department of Education Star Schools project. Kentucky is the only state to be awarded a Star Schools statewide grant this fiscal year.

KTLN uses interconnected digital video switches at eight university hub sites to connect distance learning classrooms throughout the Commonwealth. KTLN is best characterized as a "network of networks" linking individual systems into a statewide web which allows the sharing of resources among a diverse partnership. KTLN is the newest "on-ramp" to Kentucky's Information Highway. It is designed to address the needs of the Commonwealth by providing access to government, to global databases, and to new markets.

The funding from the KTLN Star Schools project will allow the University of Kentucky to place distance learning classrooms at Prestonsburg Community College, Elizabethtown Community College, and on the Covington Campus of Northern Kentucky University.

The KTLN Star Schools project is not limited to public institutions. As a part of the project the University of Kentucky will install an interactive video classroom on the campus of Saint Catherine's College in Washington County as well as the Scott County High School campus in Georgetown, Kentucky. The total Star Schools project will fund 46 new distance learning classrooms in universities and in over 20 high schools across the Commonwealth of Kentucky.

The University of Kentucky is also developing a Telemedicine Network in eastern Kentucky. The objectives are to investigate the feasibility, costs, appropriateness, and acceptability of telemedicine

consultations for improving access to health services for rural residents and reducing the isolation of rural practitioners. Specialty services that will be provided over the network include radiology, cardiology, dermatology, mental health and/or substance abuse, obstetrics and gynecology, orthopedics, subspecialties of pediatrics, and resuscitation of trauma patients.

The Telemedicine Network utilizes the same video compression hardware as the UKITV Network and the KTLN. The Telemedicine Network will be connected to and fully compatible with these distance learning networks.

The distance learning and telemedicine initiatives have been a big factor in driving the development and expansion of the digital telephone infrastructure in Kentucky. The Commonwealth of Kentucky awarded a contract for the "Kentucky Information Highway" on December 23, 1994. The winner of the "Kentucky Information Highway" bid was the Local Exchange Carrier Telephone Group (LECTG). LECTG is made up of South Central Bell, Cincinnati Bell, GTE, and 17 local phone companies in Kentucky. The goal of the Kentucky Information Highway is to provide state and local government and state supported institutions with a cost effective digital telephone infrastructure. Development of the network is already underway. This network of T-1 lines (T-1 service to all of Kentucky's 120 counties) will support the bandwidth requirements of distance learning, telemedicine, as well as data and voice networking throughout the state. The contract specifies that the cost of T-1 service in the state will be $665 per line per month and the rate is not "distance sensitive" which means that a line from one end of Kentucky to the other will cost the same as a line from Lexington to one of the University Community Colleges. This standardized rate will save users money and it will make budgeting for expansion projects much easier.

The University of Kentucky is in the process of connecting all of its 14 Community College Campuses to Lexington through T-1 lines. While the initial motivation for installing T-l's was to transmit instructional compressed video, we have found that the cost savings from utilizing the T-1's for voice and data transmission now justify the installation to campuses that do not currently have interactive video classroom. These T-1 lines provide high quality, high speed connections for long distance telephone service and more importantly for access to the centralized databases on the Lexington Campus such as the UK Library NOTIS system and ERIC, MEDLINE, Expanded Academic Index, IAC National Newspaper Index, Company Profiles, and the Center for Research Libraries. Most importantly, these high bandwidth connections provide connections to the Internet.

The University is beginning a new initiative to increase off-campus Internet access for all students, faculty, staff, and friends of the University. UK awarded a bid to MCI, Inc., in April 1995, to provide Internet access in Lexington and in each community college community at a nominal cost. The award specifies that MCI will install a bank of modems on each campus and provide access services to students, faculty, and staff at a rate of $12.00 per month. Other members of the community can subscribe at a rate of $17.00 per month. This service will be another addition to the growing list of information resources in our communities.

3. Computer Utilization

Owensboro is a small community in rural western Kentucky. In 1991, Owensboro Community College, a two-year, associate degree-granting institution, responding to the local business community's need for

instruction by distance learning, designed and implemented the National Distance Learning Center (NDLC), a free on-line database of distance learning programs and products accessible by computer modem or by Internet.

Owensboro Community College's experience with providing on-line learning services allowed the college to leverage its successes into new services for the Owensboro and Daviess County communities. The college began to offer on an experimental basis a gateway to some Internet servces by subscription. The gateway also provided local e-mail and database information.

This Internet gateway quickly became more popular than was expected. In a few few weeks, the college registered more than 300 users. Today, the gateway processes more than 700 dial-ins each day.

As impressive as the numbers are, more impressive is the impact it has had on the community. In March, 1994 the NDLC sponsored an e-mail-a-thon which brought young people from around the community and world together for live conversation by Internet e-mail. In June the college was the site for a reception given by mothers of children with multiple disabilities who have learned to use the technology as an electronic support group.

By the summer of 1993, two years after the opening of the NDLC, representatives from the three colleges in Owensboro, city and county governments, public schools and private business came together for the purpose of designing and deploying a community-wide high speed data network that would interconnect all educational institutions, government, medicine, and other organizations into a single network. The purpose of the Community Networking Cooperative was to provide e-mail and data and to allow sharing of computing resources.

The Community Networking Cooperative has succeeded in securing some pieces of the network. For example, during the most recent renewal of the city franchise, the cable company agreed to provide free to the city a system-wide data network on their fiber backbone. The CNC, through support from NDLC and the College, also established the first free-net in the Commonwealth of Kentucky. This data network, to be fully implemented by this summer, will provide community e-mail and data servces to all citizens by dial up modem.

Soon the mayor of Owensboro will announce the creation of an Information Technology Commission. Under the direction of the Chamber of Commerce, this commission will convene CEO's to bring a high level of attention to the issues of information technology with industry recruitment as its highest priority.

As the level of technology consciousness and application developed within the community of Owensboro and Daviess County, Kentucky, the community turned to the community college to provide leadership. The mission of Kentucky community colleges creates a special relationship between college and community with the result that the colleges are highly responsive to community needs.

There are direct applications to education as well. The college is studying and experimenting with ways to deliver training to the learner by data networking. The community-wide network, when fully implemented , will provide the learner with access to multimedia, voice, video and data, and learner-programmed instruction. Virtually any desktop computer in the Owensboro community will

have the capability to connect with the Kentucky TeleLinking Network (KTLN), a statewide network of interactive classrooms. The KTLN represents a partnership among all Kentucky universities, state government, and public schools. Through developing technologies and partnerships, Owensboro Community College is in a position to lead the state in providing cost effective, learner-programmed and directed education to the citizens of its hometown.

4. Library Applications

The University Libraries are the focal point for information services to the University Community and continue to focus on providing information in electronic formats. The library system continues to examine and acquire those resources that provide the most efficient delivery of that information, working toward a unified, user-friendly access gateway for all users. The goal is to provide electronic information resources in a reserach university library with emphasis on "just-in-time" rather than "just-in-case" acquisition of materials.

To accomplish these goals ground was broken for the W.T. Young Library on November 6, 1994. When complete in the Spring of 1997 this $58 million facility will provide state-of-the-art information resources. The entire building will be wired with fiber optics. The 350,000 square foot facility will have a seating capacity of over 4000 and will provide either wired or wireless network connectivity for every patron as well as every faculty and staff member in the building. Computer labs with high speed workstations will be provided to patrons and will be available 24 hours a day. A centralized media retrieval system will provide users in classrooms and at workstations with immediate access to a wide variety of multimudia resources including CD ROM, laserdisk, video and audio tape and emerging technologies. This system will provide the model for extending these services to the entire campus, to the community college campuses, and statewide.

5. Adaptations for the Small College

What advantage do these initiatives at a large state university offer to small colleges? They offer models that can serve as a starting point for projects on your campus. All of the initiatives in this paper utilize off-the-shelf hardware and software and can be implemented at your institution.

Saint Catherine's College is preparing to take advantage of the interacitve video network mentioned above. Spalding University in Louisville is also interested in installing a compressed video classroom so they can become a full partner in a new statewide initiative to train place bound students as nurse practitioners and nurse midwives. Small colleges such as Georgetown College are connected to the University's NOTIS library. When a patron on the university campus accesses NOTIS they choose the Georgetown NOTIS database and a patron on the Georgetown campus can choose the UK database.

[Graphics will be included at the time of the presentation.]